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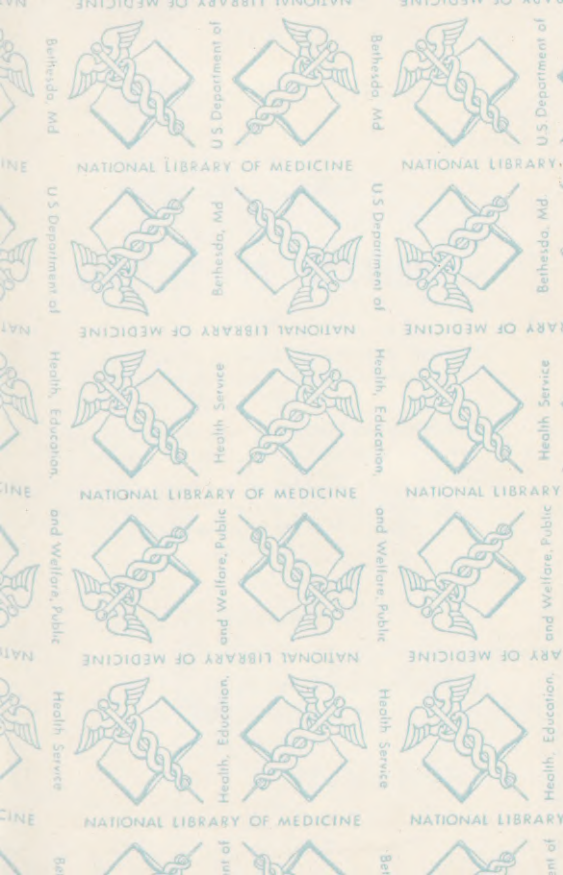


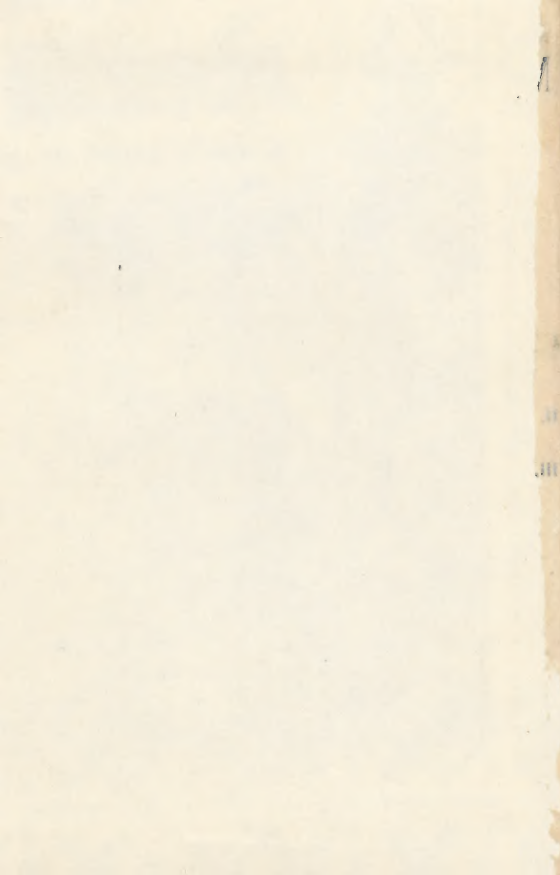
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THE
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QUIZ LIST

OF

CHEMISTRY AND TOXICOLOGY

INCLUDING

Fifty questions on Chemical Theory with references
to Dr. Clifford Mitchell's Dental Chemistry.
Second Edition.

Five hundred questions on Pharmaceutical Chemistry
General Chemistry, and Toxicology.

Laboratory course in Medical Chemistry and Toxi-
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BY

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PART I.

CHEMICAL THEORY.

1. Give the symbols for the following elements:—potassium, sodium, lithium, barium, strontium, calcium, magnesium, aluminium, cerium, manganese, zinc, iron, nickel, cobalt, cadmium, lead, tin, bismuth, copper, silver, mercury, platinum, gold, hydrogen, silicon, antimony, carbon, boron, molybdenum, chromium, arsenicum, phosphorus, iodine, bromine, chlorine, nitrogen, sulphur, oxygen.
2. Give Latin names for the following elements:—potassium, sodium, iron, lead, copper, silver, mercury, gold, antimony.
3. What is an element?
4. Define molecule; atom; element; compound.
5. What is chemical affinity?

6. What is a symbol and what does it designate?
7. In question one, distinguish electro-positive from electro-negative elements.
8. How many atoms usually to the elemental molecules? exceptions.
9. How denote a number of atoms of an element? example.
10. How denote a molecule of an element? example.
11. How denote a number of molecules of an element?
12. Define atomic weight. Give the atomic weights of oxygen, sulphur, nitrogen, hydrogen, chlorine, sodium, potassium, calcium, carbon.
13. How is percentage composition calculated? calculate the percentage composition of KNO_3 ; of CaCO_3 .
14. Definition of valence? in question one assign valence to all the elements mentioned (See table 2, page 41, Mitchell's Dental Chemistry, 2d Ed.)
15. How may valence be expressed?

16. In question one, select such elements as vary in valence, and tabulate them (See Mitchell, p. 43, table 3.)
17. What are artiads and perissads?
18. Explain the relation of density to molecular weight.
19. What is the law of definite and multiple proportions?
20. What is a binary compound?
21. Write the formulæ for the chloride, bromide, iodide, fluoride, oxide, and sulphide of the following elements: Na, K, Li, Ag, H, Mg, Zn, Ba, Ca, respectively.
22. In writing binary formulæ, does the positive or negative element precede?
23. In reading binary formulæ, what change is made in the name of one of the elements?
24. In which one is the change made, in the negative or positive?
25. What is a binary compound? Give an example. How do you recognize a binary?

26. Definition of anhydride?

(*Ans.*—Oxide of a non-metallic element, which, in combination with the elements of water, forms an acid.)

27. Are all oxides anhydrides? are all oxides of non-metallic elements anhydrides? are all anhydrides oxides? Give examples.

28. How many oxides of chlorine are there?
(*Ans.*—Three known in the separate state, and two combined with water to form acids.)

29. What anhydrides of chlorine are there?
(*Ans.*—Two: hypochlorous and chlorous.) Formulæ?

30. From what oxide is chloric acid theoretically derived?
(*Ans.*—Chloric acid is formed by the combination of chloric oxide and water; chloric oxide does not exist in the separate state.)

31. How many binary compounds of nitrogen with oxygen are known?
(*Ans.*—Five.)

32. To what compounds of nitrogen with oxygen does the term anhydride properly apply? (*Ans.*—Those forming, plus water, hyponitrous, nitrous and nitric acid, respectively.)
33. Write the formulæ for these anhydrides?
34. What oxides of P, As, Sb and Bi are known? (*Ans.*—Two each, —ic and —ous.)
35. Write the formulæ of all these in 9.
36. What are the two oxides of sulphur? are they anhydrides? formulæ?
37. Does hyposulphurous oxide exist in the separate state? (*Ans.*—No.)
38. Write the formulæ for all the anhydrides existing in the separate state of the following elements: Cl, N, and S.
39. Write the formulæ of the following oxides: carbonic, carbonous, silicic, stannic, stannous, platinic, bromous, chlorous, iodous, iodic, bromic, mercuric, cupric. Which are anhydrides?

40. Write the formulæ for mercuric and cupric iodide, chloride, bromide, sulphide, and arsenide.
41. Write the formulæ for mercurous and cuprous iodide, chloride, bromide, sulphide, and arsenide.
42. What valence indicated by word plumbic?
43. Valence of lead in plumbic peroxide?
44. Write the following formulæ: Ferrous, mercurous, cuprous chloride, bromide, iodide, hydride, oxide, sulphide, and arsenide.
45. Write the following: Ferric, mercuric, cupric sulphide, chloride, iodide, bromide, arsenide.
46. Valence of manganese in manganic dioxide? formula?
47. Valence of iron in ferric dioxide? in ferric peroxide?
48. What is a ternary compound? give examples.
49. Difference between oxy- and sulpho-compounds? examples.

50. Define the terms, acid, hydroxide, and salt, with examples.
51. How can you tell them apart? give the formulæ.
52. Write the formulæ for the following acids: nitric, iodic, bromic, chloric, nitrous, iodous, bromous, chlorous, hyponitrous, hypobromous, hypoiodus, hypochlorous.
53. Write the formula for every inorganic substance in the bottles at your desks in the Laboratory.
54. Write the formulæ of the following salts: cadmium, mercuric, ferrous, and aluminic, sulphate, nitrate, and chloride.
55. Given that the formula for phosphoric acid is H_3PO_4 , write the formulæ of the following phosphates: sodium, potassium, lithium, ammonium, silver, barium, strontium, and magnesium; ferric, cupric, mercuric, aluminic, bismuthic; ferrous, cuprous, mercurous, and manganous.

56. Read the following formulæ: KNO_3 , CaSO_3 , NaIO_3 , KClO , Fe_2HO , $\text{Ca}(\text{NO}_3)_2$, MgH_2O_2 , HClO , BaSO_4 , As_2O_3 , HgCl_2 , $(\text{NH}_4)_2\text{CO}_3$, MgO , H_3N , H_3As , AuCl_3 , Fe_2Cl_6 and CuCl .
57. Write the formulæ for the following: sodium, ammonium, barium, cupric, cuprous, magnesium, strontium, mercuric, mercurous, ferric, ferrous, aluminic, and calcium hydrates.
58. What is a radical? give examples. Are radicals positive and negative? how is the valence of a radical determined? what is hydroxyl?
59. Write the following formulæ: Phosphates: barium, sodium, lithium, strontium, ferric, ferrous, mercuric, mercurous, cupric, cuprous, ammonic, magnesium, trisodic, hydrodisodic, disodic hydric, aluminic, hydric, acid sodium, neutral sodium, and basic sodium.
60. What is glacial phosphoric acid? what important difference between

H_3PO_4 and HPO_3 , as regards albumen?

61. What is the formula for ortho-boric acid? for mono-meta-phosphoric acid? for di-meta-phosphoric acid? meaning of the terms ortho- and meta-?
62. Give modern chemical names for the following: ammoniated submuriate of mercury, sulphuret of potassa, chloride of soda, hydrated sulphuric acid, sesquioxide of iron, muriate of ammonia, lithate of lime, perchloride of iron, protochloride of mercury, muriatic acid and bicarbonate of soda.
63. Read the following: NaHCO_3 , KNaSO_4 ,
 $\text{K}(\text{NH}_4)\text{SO}_3$, CaHPO_4 , $\text{Ca}_3(\text{PO}_4)_2$,
 $\text{Ca}_4\text{H}(\text{PO}_4)_3$, FeS , KH_2PO_2 ,
 $\text{Fe}_2(\text{H}_2\text{PO}_2)_6$, $\text{Na}_2\text{Cr}_2\text{O}_7$, and
 $\text{Li}_2\text{Mn}_2\text{O}_8$.

PART II.

PHARMACEUTICAL AND GENERAL CHEMISTRY.

64. What is the color of potassium carbonate? of potassium phosphate?
65. How do potassium carbonate and phosphate differ in appearance?
66. Are they both soluble in cold water? any difference in solubility?
67. Reaction with blue litmus paper of the solution of the carbonate?
68. Reaction of the solution of the phosphate?
69. Reaction with red litmus paper of solution of each?
70. Feeling of each solution when rubbed in the hands?
71. Are these substances heavy like the compounds of mercury, lead, etc?
72. Does either of them volatilize, with abundant fumes, when heated?



73. Difference of behavior of each, when an acid is poured on them?
74. Does the potassium part of the substance cause the difference? why?
75. With which of the two do you get ppt. when the gas, after adding acid, is conducted into lime water?
76. Describe the gas generating apparatus.
77. What would be the effect if both tubes in it were above water?
78. Why do we use water at all in our lime water experiments?
79. What possible danger in the experiment, and how prevented?
80. Effect of blowing air from the lungs into lime water?
81. Is there any resemblance between a candle flame and a respiration?
82. Would the gas given off from the carbonate support respiration?
83. Why did the English prisoners die in the Black Hole of Calcutta?
84. Give the names used in Homœopathic Pharmacy for potassium carbonate;

phosphate; dichromate; permanganate.

85. Which of these are acid (when in solution) to litmus? which alkaline?
86. Which have color? which none?
87. Are any of these poisonous? which the most so?
88. What is Condyl's Fluid? strength of it? uses?
89. Is potassium permanganate wholly soluble in water?
90. Are the other salts wholly soluble in water?
91. What is sal-tartar?
92. What are salts of tartar?
93. Which of the salts effervesce when an acid is added?
94. Which change color?
95. Effect of filter paper and urine on solutions of potassium permanganate?
96. Are paper and urine inorganic or organic? reasoning then in regard to solutions of the permanganate?

97. Cause of the loss of color? (Loss of oxygen.)
98. Is, then, the permanganate an oxidizing or a deoxidizing substance?
99. For what, therefore, valuable?
100. If you wished a disinfectant, and had only these four to choose from, which would you take? why?
101. If you had dropped acids on your hands, which one of the four would you choose as an application? why?
102. If you wished to make carbonic acid gas, which would you use?
103. If you wished to prepare these four for Homœopathic use, would you triturate all with milk sugar?
104. Which ones may be triturated and which not? why?
105. Do the specimens which you have examined, enable you to answer question 104 correctly? why?
106. Which of the potassium compounds thus far examined are binary? How do you recognize binaries by name?

107. Meaning of the terms, deliquescent, efflorescent, permanent?
108. Meaning of the phrase, "Dissolves in its water of crystallization"?
109. What is "Water of crystallization"?
110. Meaning of the phrase, "Readily volatilized by heat"?
111. Meaning of the word, "triturate"?
112. Comment on the solubility in water, of the compounds thus far examined: Are they, as a class, soluble or insoluble?
113. Color of the majority of compounds of potassium examined?
114. Regarding the compounds of potassium, thus far examined, as representing inorganic compounds of potassium in general, what may be said of inorganic potassium compounds, as regards state, form, solubility, and volatile character?
115. Which ones, thus far examined, exhibit marked changes when treated with hydrochloric acid?



116. What is the *taste* of solutions of KI and KBr?
117. Which is, at present, the most expensive compound of potassium thus far examined? (*Ans.*—Iodide.)
118. Uses in medicine of the iodide and the bromide?
119. Is the iodide soluble in water?
120. In what is the iodide soluble?
121. What is the test for iodine?
122. Difference in physical character between iodine and potassium iodide?
123. Difference in formula?
124. What is the tincture of iodine?
125. How do you prepare the starch solution, used as a test for iodine?
126. What happens when you add the starch solution to the following:
(a) iodine, (b) potassium iodide,
(c) potassium bromide?
127. Use of chlorine water in this test? precaution?
128. How do you make chlorine water?
129. How would you prove that iodine in

tincture of iodine is uncombined;
but in iodide of potassium is combined?

130. What are the Halogens?
131. In what different states do they occur?
132. Are they poisonous? corrosive?
133. Which is the least active chemically?
134. Which is the more active, chlorine or iodine?
135. In what state does bromine occur?
of what use is it in medicine or surgery? (*Ans.*—Escharotic; disinfectant.)
136. Effect of dropping bromine on the skin? antidote?
137. How may potassium bromide be made?
138. How is potassium iodide made?
139. Any physical resemblance between Br and KBr? between I and KI?
140. What is the result if chlorine water and starch paste be added to a solution of KBr?

141. What is Aqua Chlorig? strength?
142. What is an Aqua?
143. What is *colorless* tincture of iodine?
144. In what is iodine soluble?
145. How are hypobromites made? (*Ans.*
—By dissolving Br in solution of an
alkaline hydrate, as NaHO.)
146. Of what use in urinary analysis is
sodium hypobromite?
147. How can you show that vegetables
(*e. g.* potatoes) contain starch?
148. What happens if a drop of KI solution
be added to a solution of corrosive
sublimate?
149. What happens if a drop of KBr
solution be added to a solution of
corrosive sublimate?
150. What is corrosive sublimate?
151. What is the color of mercuric iodide,
and in what is it soluble? (Reason
from experimenting. See question
148.)
152. Meaning of the phrase, “soluble in
excess of reagent”?

153. What is fluorine? where and how in the body is it found?
154. In what form does KHO occur?
 K_2CrO_4 ?
155. Feeling of the solution of KHO? is it poisonous? is it corrosive? antidotes?
156. What happens when KHO is dissolved in water?
157. What is the purest form in which KHO occurs in commerce? (*Ans.*—That made from metallic potassium.)
158. What is a very pure variety? (*Ans.*—That called, "By alcohol.") Explain what is meant.
159. What is Liquor Potassæ?
160. What happens when a solution of K_2CrO_4 is added to a solution of a salt of lead?.
161. What is the strength of *liquor potassæ*?
162. Of what is it composed? just how made? specific gravity? use in urinary analysis?

163. Reaction of liquor potassæ? feeling when rubbed on hand? is it corrosive? is it poisonous? antidote?
164. Tell how to make a 5 per cent. solution of potassium chromate in water?
165. Commercial name of the precipitate formed by adding solution of salt of lead to a solution of potassium chromate?
166. What is the difference between lead and a salt of lead? does a salt of lead taste salty?
167. Difference between salt and a salt?
168. Do compounds of sodium resemble those of potassium, as a rule? what physiological difference? (*Ans.*—Salts of sodium are less irritating than those of potassium).
169. Which would be more irritating to the stomach, iodide of potassium or iodide of sodium?
170. What is the chemical name and formula of common salt?
171. In virtue of what property of salt is

it difficult sometimes to shake salt from a salt cellar?

172. What gas is given off when H_2SO_4 is added to common salt? how recognized?
173. Commercial name for sodium sulphate?
174. Give Homœopathic pharmaceutical names for the following: potassium bromide, potassium iodide, sodium chloride, sodium sulphate, sodium phosphate, and potassium hydrate?
175. Why are not metallic sodium and metallic potassium of use in medicine?
176. How are these elements kept?
177. Effect of putting them into your pocket?
178. What happens when they are thrown into water? what is formed?
179. Given, that sodium chloride, sodium sulphate, and sodium phosphates are types of sodium compounds, what may be said as to the state,

color, and solubility of most compounds of sodium?

180. How is silver nitrate made? what is its action on the skin? of what value in medicine?
181. Is silver nitrate poisonous? antidote? Chemical action of antidote?
182. Why not give HCl as an antidote?
183. Meaning of the word neutralize? how can you tell when you have added enough acid to an alkali to neutralize it?
184. In what is silver chloride soluble? when did you see silver chloride? action of light on silver chloride?
185. Give the list of operations performed in examining a substance.
186. Describe silver nitrate.
187. What should be the reaction of solution of pure silver nitrate?
188. In what two forms does silver nitrate occur in commerce?
189. Give the proper chemical name for silver nitrate, and any other names

you have heard, (including Homœopathic).

190. How is silver nitrate made?
191. Is it poisonous? antidote?
192. Stain on organic matter?
193. Any change in silver nitrate on exposure to light? to what is the change due? (*Ans.*—Precipitation of metallic silver in finely divided form.)
194. Use of silver nitrate in medicine?
195. What happens when a chloride in solution is added to a solution of silver nitrate? what is formed, and in what is it soluble? in what is it insoluble?
196. How would you detect common salt in urine?
197. What is sal-ammoniac? give proper chemical name. Homœopathic name. Chemical formula.
198. Is sal-ammoniac a compound of ammonia? is the term *muriate* of ammonia now used for it by chemists?

199. Describe the substance as regards state, color, solubility, etc.
200. What happens when sal-ammoniac is heated?
201. What happens when solution of sal-ammoniac is added to solution of silver nitrate? proof?
202. Could sal-ammoniac be used as antidote in cases of poisoning by silver nitrate? why?
203. Has sal-ammoniac any odor of ammonia?
204. In what state does ammonium hydrate occur? what is household ammonia? what is ammonia gas?
205. When we add "ammonia" to a precipitate, in order to test its solubility, do we use ammonia gas?
206. What is Aqua Ammoniae? why is it not called Liquor Ammoniae? strength? (*Ans.*—10 per cent). 10 per cent. of what?
207. What is Aqua Ammoniae Fortior? precautions in handling it?

strength? (*Ans.*--28 per cent.)
28 per cent. of what?

208. How is ammonia gas made?
209. What odor has Aqua Ammoniae?
210. Is Aqua Ammoniae poisonous? antidotes?
211. What must be done at once, when ammonia gas is inhaled?
212. What is the ammonium carbonate of commerce really a mixture of? (*Ans.*—Ammonium carbonate and an organic compound ammonium carbamate).
213. Describe ammonium carbonate, as you have found it. What happens when it is heated? action of acids? reaction of solution? odor of substance?
214. What is sal-volatile? what is harts-horn?
215. What happens when compounds of ammonium are brought near hydric chloride?
216. How may ammonium carbonate of commerce be freed from carbamate?

(*Ans.*—By treatment with alcohol, which dissolves the carbamate.)

217. What happens when ammonium carbonate is exposed to air? (*Ans.*—Gradually loses NH_3 and CO_2).
218. Describe calcium carbonate and give its chemical formula.
219. In what respect does the Homœopathic “*Calcarea Carbonica*”, differ from chemically pure calcium carbonate?
220. What is the chemical composition of “Chalk”? is the chalk now used for blackboards the same thing as chalk which occurs in nature?
221. What is limestone essentially composed of? marble? what is “soda water”, so called? Describe the reaction which occurs in making soda water.
222. Is calcium carbonate soluble in water? how is it that various mineral waters are shown to contain calcium carbonate in solution?
223. In what tissues of the body is calcium

carbonate found? (*Ans.*— Bones, teeth, blood, lymph, chyle, saliva, and sometimes in urine.)

224. How comes it to be dissolved in the fluids of the body? (*Ans.*—Owing to the presence of alkaline chlorides, or carbonic acid.)
225. Which is the more abundant in the parts of the body named in No. 223, calcium carbonate or phosphate?
226. Describe calcic phosphate and give its chemical formula and Homœopathic name.
227. How does the solubility of calcic phosphate in cold water, compare with that in hot? Is this the usual case with inorganic salts?
228. How does the solubility of calcic phosphate in alkaline solutions compare with that in acids?
229. If you wished to dissolve a urinary sediment, containing a calcic phosphate, would you add acids or alkalis? would a urinary sediment,

containing calcic phosphate, increase in bulk as the urine cooled?

230. Describe a test for phosphates? how may a carbonate readily be distinguished from a phosphate without this test?
231. What is the chief mineral constituent of bone? of the enamel of the teeth?
232. Which, then, would be more injurious to the teeth, acid or alkaline drinks?
233. In the museum of the College of Physicians and Surgeons, in New York, there is a fibula tied in a knot: explain what has been done to it?
234. What happens in the body when the bones lack calcium phosphate?
235. In what tissues of the body is calcic phosphate found? (*Ans.*—In all.)
236. Is there any other mineral salt, in the body, which equals it in quantity? (*Ans.*—No.)
237. How is it that calcic phosphate is in solution in the blood, an alkaline fluid? (*Ans.*—Union with albumin-

ous substances increases its solubility.)

238. What happens when urine is made alkaline? why?
239. What mineral salt is found in the ash of albuminous substances? why?
240. Of what substance, is the Homœopathic "Hepar Sulphur", essentially composed? give full Homœopathic name.
241. What is the difference between the Homœopathic "Hepar Sulphur", and the so-called "Liver of Sulphur"? (*Ans.*—The latter is K_2S .) Homœopathic name?
242. What is the old name for the sulphides?
243. Describe calcium sulphide.
244. Are any of the sulphides soluble in water? (*Ans.*—Those of sodium and potassium are soluble.)
245. Describe in full, the action of an acid on a sulphide. What odor is noticeable? formula of substance to which the odor is due?

246. Reasoning as to the constitution of the substance which causes the bad odor of rotten eggs?
247. Compounds of what element are the so called "Lime Salts"?
248. What is "Lime", and how is it made? what is "Limestone"? give formula.
249. Is lime soluble in water? what happens, then, when water is added to lime?
250. What is "Lime water"? how made?
251. What is the reaction of lime water? for what general purpose, therefore, is lime water valuable in medicine and in surgery?
252. In burns by what substance, is lime water especially useful? (*Ans.*—Bromine.)
253. What is "Carron oil", so called? (*Ans.*—Equal parts linseed oil and lime water.) For what is it used?
254. What happens when a solution of oxalic acid, or an oxalate, is added to a compound of calcium?

255. For what poison, then, is lime water an antidote? why?
256. What happens when lime water is exposed to the air for a time? why?
257. What happens when air from the lungs is blown into lime water? why?
258. How would you tell urine had fermented after the addition of yeast?
259. What gas, then, is evolved during process of fermentation?
260. Why are the fumes from a lime-kiln poisonous? give equation.
261. What are gypsum, glauber salts, epsom salts, and white vitriol, respectively? which are soluble in water?
262. What reagent will ppt. sulphates in solution? action of acids on the ppt.? formula for the ppt.?
263. What two substances, mentioned in No. 261, strongly resemble one another? why is it important to be able to distinguish them? how would you tell one from the other?



how would you detect sulphates in urine?

264. Compounds of what element, accompany those of Ca in the body?
265. Of the following select the most poisonous: sodium chloride, sulphate; potassium chloride, sulphate; calcium chloride, sulphate; barium chloride, sulphate; zinc chloride, sulphate?
266. Give Homœopathic name for each in No. 265.
267. Describe cupric sulphate.
268. Give the chemical formula, proper chemical name, and commercial names for it. Homœopathic name?
269. What is the color of the compounds of copper?
270. Effect of exposure to the air on cupric sulphate?
271. Uses of cupric sulphate in medicine? of what liquids used in urinary analysis is it an ingredient?
272. What impurity usually found in it?
(Ans.— FeSO_4 .)

273. What action has glucose when heated with alkaline solutions of cupric sulphate?
274. Difference between oxidation and reduction? give examples of oxidizing agents? of reducing agents?
275. How is cupric sulphate made? equation?
276. Is it poisonous? antidotes?
277. By what chemical tests would you recognize cupric sulphate? how tell a sulphate from a nitrate or a chloride?
278. What is Cuprum Aceticum?
279. What is Cuprum? how is it prepared for Homœopathic use?
280. In general, how are metals obtained for Homœopathic use?
281. Describe mercuric chloride.
282. Give all the names for it you can remember. What is the proper Homœopathic name for it?
283. How is it made? equation? what do you mean by sublimation?

284. What remarkable peculiarity as to solubility has mercuric chloride?
285. Action of light and of organic substances on solutions of it?
286. Actions of heat on mercuric chloride?
287. For what is it now largely used in medicine and surgery?
288. Difference between germicides, antiseptics, and disinfectants?
289. Are all antiseptics germicides? are all germicides antiseptics?
290. Of what ones is mercuric chloride an example?
291. Is mercuric chloride poisonous? is it more poisonous than any of the substances thus far examined? antidotes?
292. Precautions to be observed in examining mercuric chloride? in triturating it? is it poisonous from external application?
293. How may any soluble mercuric compound be easily recognized? how tell that it is a chloride, rather than a sulphate, or a nitrate?

294. Describe lead acetate, giving proper chemical name. Commercial name. Homoeopathic name.
295. How is lead acetate made?
296. Effect of air on solutions of lead acetate? (Carbonate formed soluble in acids.)
297. How would you clear a solution of lead acetate which had become turbid?
298. What is Liquor Plumbic Sub-acetatis?
299. Are compounds of lead poisonous? which is the more poisonous, mercuric chloride or lead acetate?
300. Effect of sulphur or sulphides on lead?
301. How do you account for the blackening of paintings?
302. What is H_2S , and how is it made? What happens when its solution is mixed with a solution of lead?
303. What is chrome yellow, and how made?
304. Action of sulphuric acid on solution of lead?

305. Describe potassium antimonyl tartrate, giving commercial name and Homœopathic name.
306. Action of HCl and of H_2S , on solutions of it?
307. What is "Arsenic," so called? what is the Homœopathic "Arsenicum Album"?
308. In what is arsenic soluble? what is Fowler's Solution? strength of it? is arsenic poisonous?
309. What is the most poisonous substance thus far examined?
310. Behavior of arsenic when thrown in fine powder on water? when heated?
311. Why is arsenic so dangerous a poison?
312. Action of H_2S on acid solutions of arsenic?
313. Describe, in full, the Marsh test for arsenic.
314. In what is the arsenic stain soluble?
315. How tell the stain of antimony from that of arsenic?
316. What principles of chemistry are

illustrated by the Marsh test?
(Hints: What substances are used?
what substances formed before
pouring in the arsenical solution?)

317. Why is it dangerous to breathe the gas after the light goes out?

318. How is the danger from explosion avoided?

319. What is hydrogen? how made? properties?

320. Is hydrogen light or heavy? is its flame hotter than other flames?

321. What is formed when hydrogen burns? why? what, then, is combustion?

322. What is oxygen? how made? properties?

323. What is the formula for water?

324. What do you mean by the molecular weight of a substance? by atomic weights?

325. What is the molecular weight of water?

326. By weight, what is the composition of water?

327. What do you mean by specific gravity? what is the specific gravity of water?
328. In what states does H_2O occur? what part, by weight, of the human body, is water?
329. Is there H_2O in air? what is it called and whence is it derived?
330. What is the freezing point of water Fahrenheit? Centigrade?
331. How do you convert Fahrenheit to Centigrade? Centigrade to Fahrenheit?
332. What is the boiling point of water in both scales?
333. What error, typographical, on line 4, of page 107, of the Dental?
334. What remarkable exception does water offer to the general rule of expansion and contraction? advantages?
335. How many pints of steam will one pint of water furnish?
336. Is steam a gas or a vapor? why?

337. A hogshead of water freezes, so that ice is level with the brim: when it melts, how much water, if any, will overflow?
338. A bucket, filled with water to the brim, freezes solid: what will happen?
339. What solvent power has water? will it dissolve gums, resins, etc.? How, then, does its solvent power compare with that of alcohol? which is the better solvent for inorganic substances? comment on the solubility of mercuric chloride.
340. Define efflorescence and deliquescence? give examples.
341. Is a hygroscopic substance always deliquescent? give an example.
342. What enters into the formation of crystals?
343. Of what value is water in bringing about chemical change?
344. What does water form with positive oxides of certain substances, as Na, K, etc.? what with anhydrides?

give examples. What is the difference between an oxide and an anhydride? give examples.

345. What is Aqua Destillata, and how made? Best water to use? (*Ans.*—Rain water, falling some time after storm has begun.)
346. Mention a few tests for purity of Aqua Destillata?
347. Which is the better solvent, Aqua Destillata, or Lake Michigan water? why?
348. What therapeutic bearing has this fact?
349. Explain the terms Aqua and Liquor, with examples.
350. For what purposes is Aqua Destillata used in Homœopathic Pharmacy? (*Ans.*—To dissolve substances insoluble in alcohol; as ammonium carbonate; and to dilute alcohol.)
351. How would you prepare Ammonium Carbonicum, 1x dil.?
352. How would you prepare the second

decimal dilution, or 2x potency, so called?

353. How would you prepare dilutions above 2x potency? (*Ans.*—One minim of the dilution below, and nine of dilute alcohol.)

354. Are aqueous solutions ever prepared otherwise for Homœopathic use? (*Ans.*—Some substances, like tartar emetic, are prepared by dissolving 1 part, in 99 of distilled water, thus forming the 2x potency. The 3x potency would be 1 minim of the 2x, and 9 of dilute alcohol; but in the 4x potency, and all higher potencies, alcohol, instead of dilute alcohol, is used. Homœopathic alcohol has sp. gr. 0.83, and contains 87% of anhydrous alcohol.)

355. Difference between 1st potency and 1x potency?

356. How is the 1st potency of ammonium carbonicum prepared? the first of antimonium tartaricum? (*Ans.*—10 of 1x potency and 90 of distilled

water; 1 of tartar emetic, crude, and 99 of distilled water.)

357. How is the 2nd potency of each prepared? (*Ans.*—1 of the 1st and 99 of the alcohol; 1 of the 1st and 99 of dilute alcohol.)
358. How are the 3rd, 4th, etc. of both prepared? (*Ans.*—1 of the preceding and 99 of alcohol.)
359. Are all aqueous solutions diluted alike for Homœopathic uses?
360. How many classes of aqueous solutions are there?
361. Mention substances belonging to each class.
362. What are the qualities of a good drinking water?
363. Describe the permanganate test for organic impurities.
364. What is a mineral water?
365. Give an example of an alkaline water; of a ferruginous, or chalybeate water; of a saline water.

366. What is the general character of Waukesha waters? of Saratoga waters? Give example of sulphur waters. Is there free sulphur in sulphur waters?
-

TOXICOLOGY:

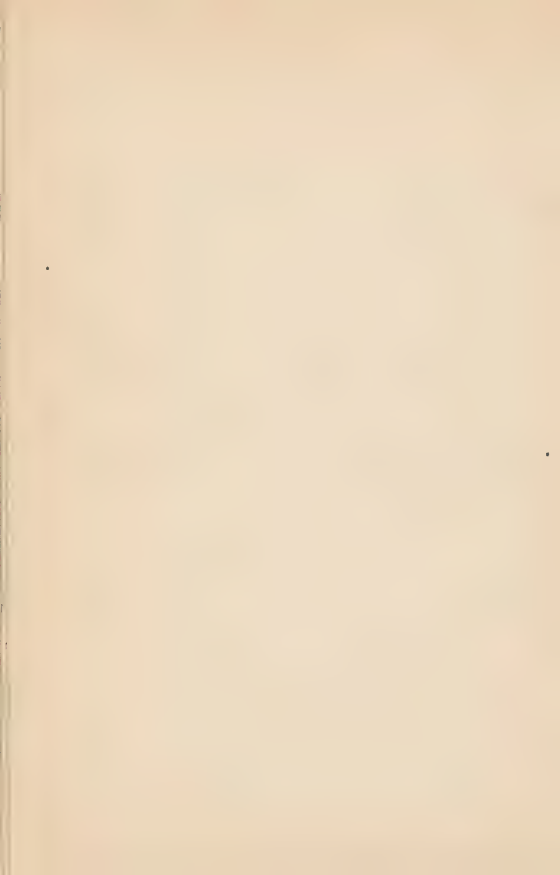
A. Inorganic Poisons.

367. Suppose a person to have been poisoned; you have secured some of the poison; what compounds of those you have had, lately, would you look for first?
368. If you had but a small quantity of the poison, what three poisons to be looked for in any event. (*Ans.* — Strychnine, arsenic, and morphine.)
369. Suppose the poison is insoluble in water, what solution would you try? (*Ans.*—HCl.) If the poison is insoluble in water, what substance of group 1 of the metals is ruled out? (Hint: What soluble

compounds of Ag, Pb, and Hg, do you know of?)

370. If the poison is insoluble in cold HCl, what would next be done?
371. If the poison be dissolved by HCl, would you test for metals of Group 1? why?
372. If the poison is soluble in water, what is the first step in analysis?
373. If a ppt. is formed, in the first step, what is the next step? what poisonous compounds are thus distinguished?
374. If nothing is found by the procedure, thus far, what is done next? what hints from the color of the ppts.? what special tests will distinguish the poisons?
375. If you were testing for As, would you prefer an alkaline or an acid solution?
376. What dry tests for As?
377. Is As a readily soluble poison? in what is it soluble?

378. What is Arsenic? what is Arsenicum Album?
379. Define Toxicology.
380. Is it easy to define the word poison?
381. In the general treatment of poisoning, by an unknown substance, what would you do first?
382. Mention several emetics in order of value.
383. What is apomorphine hydrochlorate, and what is its action? what is the hypodermic dose?
384. What is the emetic dose of ZnSO_4 ? of CuSO_4 ? Which is preferable in opium poisoning?
385. What household remedies for provoking vomiting?
386. How would you promote vomiting after it once begins?
387. How often should the patient be made to vomit?
388. Describe the process of washing out the stomach.
389. What is the next step in the general treatment of poisoning?



390. Mention several bland liquids.
391. Next step?
392. What special steps may be necessary?
393. Mention several stimulants. What stimulant advisable in narcotic (Opium, Belladonna) poisoning?
394. What is the dose of aromatic spts. of ammonia?
395. How would you perform artificial respiration, in opium or other narcotic poisoning?
396. How would you rouse a patient by electric shocks? by flagellation? by douches?
397. In prolonged cases, what operation is not to be forgotten?
398. How would you feed a patient that could not take food by the stomach?
399. How would you administer emetics or stimulants, if you could not get patient's mouth open?
400. Mention convenient enemata.
401. What are the most important irritant poisons? the corrosives? Symp-

toms of irritant poisoning? of corrosive poisoning? General treatment of irritant poisoning?

402. What are the general symptoms of irritant poisoning?
403. What disorder resembles, in its symptoms, irritant poisoning? how differentiated?
404. Name several important irritant poisons.
405. What kind of a poison is arsenic? What is the chemical constitution of the poison "Arsenic"?
406. What substances commonly used in the arts, contain arsenic?
407. What pharmaceutical preparations contain arsenic? strength of each?
408. What greens are arsenical?
409. Give all the names you can for arsenic? What is the official name for it in the U.S.P.? How is arsenic made?
410. What is the color and appearance of arsenic? Has it taste? Is it readily soluble in water? In what

is it soluble? What solvent is used in making Fowler's solution? Peculiarity of powdered arsenic with reference to water? What is its sp. gr.? Different forms in which arsenic occurs? Action of heat on arsenic?

411. Different modes of application by which arsenic may prove poisonous?
412. Usual symptoms of arsenic poisoning? What variations noted? Is it always possible to decide on the poison from the symptoms?
413. Most important post-mortem appearances? Preservative powers?
414. Average fatal dose?
415. Usual time of death in acute poisoning?
416. Describe the treatment of arsenic poisoning in detail. How is the antidote made?
417. What is Reinsch's test? Marsh's test? How told from Sb?
418. What is corrosive sublimate? Give all names you can for it, including

chemical formula, name in U. S. P., and the Homœopathic name.

419. Do the symptoms of poisoning by this agent begin soon or late? why? taste? stool and vomit?
420. Fatal dose of corrosive sublimate? post-mortem appearances?
421. Treatment?
422. How would you recognize corrosive sublimate, if you find it in powder or solution?
423. What is tartar emetic? give three names.
424. Is it as poisonous as arsenic or corrosive sublimate? how distinguished from these two poisons? fatal dose?
425. Treatment?
426. Is acute poisoning by salts of lead very common?
427. What are some poisonous salts of lead? what is sugar of lead? what is Goulard's extract.
428. Treatment of acute poisoning by lead salts?

429. Symptoms of chronic lead poisoning? what term for this condition?
430. What is Paris Green? treatment of poisoning by it? color of vomited matter?
431. Chemical formula and appearance of potassium dichromate? color of stools and vomited matter? fatal dose? treatment?
432. Treatment of poisoning by tincture of iodine? color of its stains? antidote?
433. Peculiarity of vomited matters and breath in poisoning by phosphorus? How are children often poisoned by phosphorus?
434. What are the secondary symptoms of phosphorus poisoning?
435. Fatal dose of phosphorus? treatment?
436. How would you treat poisoning by, say: nitre, cream of tartar, or liver of sulphur?
437. How would you treat poisoning by salts of zinc? by nitrate of silver? by barium compounds?

Pharmaceutical and General Chemistry and Toxicology: B. Organic.

438. How can you readily tell whether a substance is organic or inorganic?
439. What is the province of organic chemistry?
440. What are the most important elements entering into the composition of organic substances?
441. In what noteworthy respect do organic substances differ, in general, from inorganic? what are the organic substances at your desk?
442. What is a radical? give examples.
443. Have radicals valence? how are radicals named?
444. How do radicals differ, from an electric standpoint? name some electro-positive radicals. What are some of the most important negative radicals?

445. What is the radical of cyanides? valence? formula for potassium cyanide? for prussic acid?
446. What is the radical for ferrocyanides? of ferricyanides? of sulpho-cyanates?
447. Formula for potassium ferrocyanide? potassium ferricyanide? potassium sulpho-cyanate?
448. What is the radical of acetates? formula for acetic acid? for sugar of lead?
449. What is the radical of oxalates? formula for oxalic acid? for calcium oxalate?
450. Radical of tartrates? formula for tartaric acid? for Rochelle salt? for tartar emetic?
451. Radical for salicylates? formula for salicylic acid? for sodium salicylate?
452. Classify organic substances of interest.
453. What is the Homœopathic "Terebinthina"? formula? properties?

454. Name some of the ethyl series of radicals, and show how it is that many important substances are theoretically formed from this series as a basis?
455. What are oxides of these radicals called? hydrates? hydrides?
456. Given that the formula for the radical methyl is CH_3 , write the formulæ for Marsh gas, sulphuric ether, wood spirit, ordinary alcohol, fusel oil, acetic acid.
457. What are haloid ethers? compound ethers? Aldehydes? Glycols? what are glycerines?
458. What is the formula for alcohol?
459. How is alcohol made?
460. Define absolute alcohol; alcohol; spirit of wine; dilute alcohol?
461. What is Homœopathic alcohol? Homœopathic dilute alcohol?
462. For what purpose is alcohol used in pharmacy?
463. Difference between a U.S.P. tincture, and a fluid ext.? between a

Homœopathic tincture and alcoholic solution?

464. How many classes of tinctures in Homœopathic pharmacy? examples of each class?
465. What is the strength of laudanum?
466. What are alcoholic solutions of volatile substances called in U.S.P.? give examples of Hom. alcoholic solutions?
467. Sugar of milk: odorless, white, hard, but little taste, not very soluble in cold water, insoluble in 60% and higher alcohol, and not fermented by yeast. Question: What important carbohydrate used in Homœopathic pharmacy? why is it so valuable?
468. In what three ways are substances triturated for use in Homœopathic pharmacy?
469. How would you prepare the 3d decimal dilution of Aconite? how are the various dilutions prepared?

470. How would you prepare the 3d centesimal dilution of Bell.?
471. How would you prepare the 3d decimal trituration of Arsenicum? the 3d dilution?
472. How would you prepare the 6th decimal trituration of Petroleum?
473. How would you prepare the 2nd centesimal trituration of Agaricus?
474. Write a prescription for a patient, to whom you wished to give the 6th decimal trituration of Merc. Cor., three grains, three times daily.
475. Conversion of triturations into liquid dilutions?
476. Theoretical constitution of carbolic acid? is it really an acid? give proper chemical name?
477. Is carbolic acid used often as a poison? is recovery from a large dose common? fatal dose?
478. Mention the chief symptoms of carbolic acid poisoning? how differentiated from opium poisoning? condition of urine?

479. Treatment? how should the patient be fed in severe cases?
480. Formula for oxalic acid? fatal dose? treatment?
481. How is chloral hydrate formed? is it poisonous? fatal dose and treatment?
482. Treatment of poisoning by chloroform, ether, and alcohol?
483. Theoretical constitution of chloroform and iodoform?
484. For what purpose is iodoform used in medicine?
485. What are glucosides? examples? what poisonous ones do you remember?
486. What is aniline? what are the aniline dyes? are they poisonous?
487. Theoretical constitution of prussic acid? fatal dose? symptoms? treatment?
488. Formula for potassium cyanide? fatal dose? treatment?
489. Formula for urea? is it poisonous? what is meant by uræmia?

490. Give the proper chemical name for the following: Marsh gas. Fusel oil. Wood spirit. Glycerine. Grape sugar. Cane sugar. Milk sugar. Spirit of Mindererus. Sugar of lead. Hard soap. Salts of lemon. Cream of tartar. Tartar emetic. Chloral. Sulphuric ether. Prussic acid.
491. What are the general properties of the alkaloids? why called alkaloids?
492. Name some volatile alkaloids. Non-volatile.
493. Name some of the alkaloids of opium. Name most important alkaloid of opium.
494. What is meant by what is commonly called "morphine"? give proper chemical name?
495. What important distinction between morphine and its salts, as regards solubility?
496. Fatal dose of morphine? symptoms? treatment?

497. Mention a half dozen preparations containing opium or morphine?
498. What is the fatal dose of laudanum? paregoric?
499. What is the smallest fatal dose of laudanum for a child?
500. What is Nux Vomica? name its alkaloid? what is Ignatia?
501. Fatal dose of strychnine? symptoms? treatment?
502. What are the cinchona alkaloids? solubility of sulphate of quinine? How could you tell it from sulphate of morphine?
503. Mention some mydriatic alkaloids.
504. Treatment of poisoning by belladonna, or by atropine sulphate.
505. Mention some myotic alkaloids.
506. Name the alkaloids from the following: aconite, calabar bean, jaborandi, coffee, tea, gelsemium, erythroxyton coca.
507. Treatment of poisoning by aconitine? by cocaine?

508. Name some of the artificial alkaloïds.
509. What are ptomaines? leucomaines?
510. Name some depressant poisons. Antidote to digitalis? treatment?
511. Treatment of poisoning by illuminating gas?
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Animal Chemistry.

512. What are proteïds? mention some of their chemical characters?
513. In what two forms are egg albumen, and blood albumen found, and what differences between egg albumen and blood albumen?
514. What peculiar property has fibrin? what is hæmaglobin, and how does it differ from other proteïds?
515. Mention some of the characteristics of peptones.
516. Describe the blood. Why is it alkaline in reaction?

517. What is meant by the term extractives? what extractives are found in the blood?
518. How would you examine a blood stain?
519. Describe chyle and lymph.
520. Of what does human milk practically consist? what are cream, butter, skim-milk, buttermilk, cheese, curds, and whey?
521. What is the most important constituent of the saliva?
522. What is tartar?
523. What is the reaction of the gastric juice and to what is it due? chief constituents of gastric juice?
524. What is the reaction of most fluids of the body? mention important exceptions?
525. Mention important constituents of the bile, pancreatic juice, and fæces. What gases are found in the stomach and intestines? definition of a ferment, with examples?

526. What is the action of ptyalin on starch?
527. What is the action of pepsin on nitrogenous foods? what temperature is most favorable to its action? what is the influence of acids on its action?
528. What is diastase? what is its action? (see Dental, page 296.)
529. What well-known substance contains diastase?
530. What, then, is the province of soluble ferments and what are soluble ferments? what is the action of pancreatin?
531. To what are pathological fermentations due? are they "bugs" as commonly thought?
532. What difference in action of hydrogen dioxide on soluble ferments and on organized ferments?
533. Whence is the sulphuretted hydrogen found in carious teeth derived?
534. What are bacteria? what are microbes?



535. State broadly the action of pathogenic microbes.
536. How is disease caused by micro-organisms? (*Ans.* — Probably by multiplication of the particular organisms in the body producing certain chemical changes in the blood and tissues, or by creation of a special ferment which sets up the anatomical changes characteristic of the particular disease.)
537. Do blood and tissues in the healthy and normal state contain micro-organisms? (*Ans.* — No. Assertions to the contrary are due to errors in experiment.)
538. Difference between septic and zymogenic organisms on the one hand and pathogenic on the other? (The former two refuse to *grow* in living tissues of living animals.)
539. Give examples of zymogenic bacteria? (*Ans.* — *Bacterium lactis* (souring of milk) and *Bacterium aceti* found in sour beer etc.)

540. Give examples of septic organisms? (Bacillus septicus found in putrid blood; Bacterium termo found in putrid urine.)
541. Give examples of pathogenic organisms? (*Ans.*—Bacillus anthracis, tubercle-bacillus, etc.)
542. What do all bacteria, pathogenic and non-pathogenic, require for growth and multiplication? (*Ans.* — Oxygen.)
543. Where do they get their oxygen? (Either in medium in which they grow or by decomposing carbohydrates and proteids.)
544. Enumerate some of the principal differences, as a class, between septic organisms, zymogenic organisms, and pathogenic organisms? (*Ans.*—Septic or putrefactive organisms find in almost all animal and vegetable fluids the substances necessary for their nutrition, but the other two are more limited; septic organisms may grow in fluids

containing simple nitrogenous compounds as ammonium tartrate, pathogenic require more complex, as proteids or the like (tubercle bacillus requiring the most complex). The zymogenic organisms require special substances as food, *e.g.*, when there is no sugar the saccharomyces cannot grow, moreover the zymogenic does not grow in the living tissues of the living animal, and definite zymogenic organisms introduced into definite substances produce definite chemical products.)

545. Distinguish the following from one another: micrococcus, bacillus, bacterium, vibrio, spirillum; also torula, leptothrix, mycoderma, zoöglæa. (See Mitchell, 2d ed., page 300.)
546. Of the following tell which are septic, which zymogenic, and which pathogenic:
Bacillus tuberculosis.
Bacillus butyricus.

Bacillus septicus.
Bacillus subtilis.
Bacillus of septicæmia.
Bacillus of typhoid fever.
Bacillus malarie.
Bacterium termo.
Bacterium lactis.
Bacillus anthracis.
Bacterium aceti.
Micrococcus ureæ.
Micrococcus of pus.
Micrococcus of the mouth.
Micrococcus of diarrhœa.
Micrococcus variolæ et vacciniæ.
Micrococcus erysipelatosus.
Micrococcus diphtheriticus.
Micrococcus pneumoniæ.
Micrococcus gonorrhœæ.
Micrococcus scarlatinæ.
Micrococcus of puerperal fever.

547. Where are micrococci normally found? (*Ans.*—In nose, mouth, pharynx, larynx, trachea derived from air.)

548. What four conditions are necessary in order to prove that a particular

infectious disease is due to a particular micro-organism. (*Ans.*—First, presence of micro-organism in question in blood or tissues of diseased man or animal; second, removal of the micro-organisms from their nidus in blood or tissues, cultivation in artificial media outside animal body excluding accidental introduction of other micro-organisms, further cultivation of several generations; third, re-introduction into body of healthy animal susceptible to the disease and thus causing the disease; fourth, finding in the so affected new animal the same organisms as in the original animal.)

PART III.

Laboratory Work in Medical Chemistry and Toxicology.

I. General scheme for examining a known substance:

Student's name Desk

Date 18 . . Chemical name
and formula of substance

1. State of Substance

2. Form

3. Efflorescent, deliquescent, or per-
manent

4. If crystalline, does it dissolve in
its water of crystallization when
gently heated in an ignition
tube

5. Does it decrepitate, deflagrate,
or detonate when heated

6. Does it volatilize readily, or give off fumes when heated.....
7. Color
8. Odor
9. Solubility in water.....
10. Reaction of solution in water...
11. If not soluble in water, in what is it soluble

II. Examine potassic carbonate:

Cover bottom of gas-generating bottle with potassic carbonate, fill bottle half full of hydrant water, fit in cork tightly and pour in ten drops of hydrochloric acid down the thistle tube, into bottle containing the mixture; introduce delivery tube into test tube containing calcic hydrate and let gas bubble through it for some time; what happens? Now remove test tube and pour into it a few drops of

acetic acid or vinegar; what happens? Now take another test tube and pour into it some fresh calcic hydrate solution, and, using glass tube, blow into the calcic hydrate solution for some time; what happens? Now pour in acetic acid; what happens?

III. Examine potassic phosphate in same way as the carbonate, and note differences. Note new tests as follows: Take reaction of potassic phosphate solution in water with litmus paper.

Do not use platinum wire for flame test, but instead, place a little of the phosphate in an ignition tube and pass closed end of the tube to and fro in the Bunsen flame. (Ignition tube to be wiped dry before using; fine for breaking one is twenty-five cents.)

IV. Examine potassic dichromate.

V. Examine potassium permanganate in the same way. Note in addition the following: (1) Filter a solution

of the substance, and note effect on the filter paper and on the solution. (2) To a very weak solution of potassium permanganate, add equal parts of urine and note effect. (3) Add equal parts of urine to a solution of potassium dichromate, and note effect. (4) Triturate a little of the permanganate with sugar of milk: do the same with the dichromate, and note result.

VI. Examine potassic iodide and bromide. Formula for each one: Make a starch paste and let it thoroughly cool: Add a little to plenty of water, and then add a few drops of tincture of iodine; what happens? Now add to some starch solution a few drops of KI solution; what happens? Reasoning? Now add to solution of KI, a drop of chlorine water; then, next add some starch solution, made as above; what happens? Reasoning? How is chlorine water made? If you have time, make chlorine water yourself.

- VII. Try the action of starch paste on the following: I tincture; KI; Br; KI plus Cl water; KBr; KBr plus Cl water; five different tests. Try action of tincture of iodine on potato: Reasoning? Try solubility of iodine in (a), water; (b), alcohol, (c), solution of KI in H_2O . Action of starch paste on iodine, dissolved in KI: Reasoning? Try addition of drop of solution of KI, to solution of corrosive sublimate: What happens if you add too much solution of KI?
- VIII. Examine KHO, and K_2CrO_4 . What happens if you boil solution of KHO and solution of grape sugar? What happens if you add a drop of solution of K_2CrO_4 to a solution of a salt of lead?
- IX. Examine sodium chloride, sodium sulphate, and sodium phosphate. Note action of H_2SO_4 on sodium chloride: What is given off? N.B. The salts of sodium resemble those of potassium, so that but one exer-

cise will be given. Ask to see metallic sodium and metallic potassium in the laboratory.

- X. Examine silver nitrate (AgNO_3), noting, in addition to usual points, stain on the hands. Add a drop or two of solution of common salt to a solution of AgNO_3 ; what happens? Divide this mixture into two parts, to one part add HNO_3 ; what action? To the other, add plenty of strong ammonia water and shake well; what result? To last one, add now more than enough acid to neutralize the ammonia; what happens? How can you tell when you have added more than enough acid to neutralize it?

To a solution of silver nitrate, add a drop or two of HCl ; what happens? Now divide the mixture into two parts as before, and add nitric acid to one part, and ammonia to the other as before; what happens? Reasoning as to the action of common salt solution, and of HCl

on solution of silver nitrate. What is common salt?

Can you get any reaction from a chloride, which you can get from HCl? Would a test, then, for HCl be of use as a test for a chloride?

What compounds does HCl form with metals, chlorates, chlorides, or hypochlorites? Comment on the term "hydrochloric acid." Is the name strictly correct from a chemical standpoint? Any other name for it?

XI. Dissolve AgNO_3 in water and divide solution into four parts; add to the first, chlorine water; to the second, common salt solution; to the third HCl; and to the fourth, NH_4Cl solution. Prove that the ppt. in all is the same. Which is the stronger element, chemically, in ammonium chloride? Add solution of ammonium chloride to ppt. formed when HCl is added to solution of AgNO_3 ; what happens? Is ammonium chloride the same as ammonia? Why? (Report of the above to be

made out on paper, not on cards.)

Examine ammonium chloride, NH_4Cl , and report on card.

XII. Examine ammonium hydrate and ammonium carbonate.

Special tests: 1. What happens when $(\text{NH}_4)\text{HO}$ is brought near HCl ? What is formed? 2. What happens when $(\text{NH}_4)\text{HO}$ is added to a solution of a salt of copper? 3. What happens when $(\text{NH}_4)\text{HO}$ is added to urine? Why? 4. What is formed, when the three mineral acids are poured on ammonium carbonate? Proof of at least one substance being formed that you have had before.

XIII. Examine calcium carbonate, CaCO_3 , and calcium phosphate, $\text{Ca}_3(\text{PO}_4)_2$.

Special tests: 1. Show how CaCO_3 resembles other carbonates, which you have examined. 2. Compare the solubility, in H_2O , of these two salts with that of the compounds of K , Na , and NH_4 , which you have examined. 3. Test the solubility of

$\text{Ca}_3(\text{PO}_4)_2$ in $(\text{NH}_4)\text{HO}$ and reason:
(a) As to what reaction urine usually has when it contains a sediment of calcium phosphate. (b) How a phosphatic sediment may be tested for, or at least suspected, by its deportment with acids and alkalis. (c) What color would phosphatic sediments in urine have? 4. Compare very carefully, the relative solubility of $\text{Ca}_3(\text{PO}_4)_2$ in cold water and in hot water. Use very little of the salt and shake well. 5. To a little $\text{Ca}_3(\text{PO}_4)_2$, in a test tube, add a little H_2O , then a drop of HNO_3 ; shake well, add a solution of ammonium molybdate, heat; what happens? 6. Test solubility of a very little CaCO_3 , in H_2O containing CO_2 ; shake well. Make CO_2 according to a previous exercise.

XIV. Examine calcium hydrate in solution, forming lime water, and calcium sulphide. Special tests: To lime water, add a solution of ammonium oxalate; what happens? To



lime water, add HNO_3 , and then ammonium oxalate; what happens? Reasoning? To lime water, add a drop or two of H_2SO_4 ; what is formed?

Examine Epsom Salt, and zinc sulphate.

Zinc sulphate is poisonous and often mistaken for Epsom salt. Note carefully all differences. Special tests: 1. To solutions of both substances, in water, add solution of some soluble salt of barium, as BaCl_2 ; what happens? Further add HNO_3 to each; what happens? What is formed in each case, and is it a readily soluble substance? 2. To solutions of each salt, add K_4FeCy_6 solution; what happens? Could you distinguish MgSO_4 from ZnSO_4 by this reaction?

XV. Examine CuSO_4 and HgCl_2 . Caution: HgCl_2 is very poisonous. Use small quantity and do not breathe fumes, when heated. Special tests: What color does water impart to the

CuSO_4 you are examining? In examining CuSO_4 , prove presence of copper by $(\text{NH}_4)\text{HO}$ test, and prove presence of sulphate by BaCl_2 . Test HgCl_2 solution with KI ; what happens?

XVI. Examine plumbic acetate (sugar of lead), and potassium antimonyl tartrate (tartar emetic). Special tests (lead salts): 1. Add H_2S ; what happens? 2. Add K_2CrO_4 ; what happens? 3. Add KI ; what happens? To sol. of tartar emetic, add HCl cautiously, one or two drops; what happens? Pour in plenty of HCl , and shake; what happens?

Examine arsenious oxide, As_2O_3 , and be careful not to breathe fumes, nor taste the poison.

Notice effect of boiling a very little in HCl , as regards solubility. Special tests: Try Marsh test. Generate H gas from Zn plus H_2SO_4 , by pouring H_2SO_4 slowly and gradually down the thistle tube.

Wrap gas apparatus in wet rag, and when gas bubbles rapidly into a test tube, touch a match to the end of the delivery tube.

Do not light too soon, or an explosion will take place. Notice the flame is colorless. Then pour in a few drops of arsenical solution; the flame grows larger, has more color, and stains porcelain. Stain is soluble in NaClO . N.B. If the flame goes out, after As_2O_3 is introduced, quickly set apparatus outside of window, as fumes are deadly poison.

XVII. Examination of waters:

1. Test for hardness: To the same quantity of all waters examined, add 10 drops of standard soap solution, and shake well; the hardest water shows the greatest turbidity.

2. Test for chlorides — urine sewage contamination: Add to an equal quantity of all waters to be examined, about 10 drops of AgNO_3

solution, and shake well; the water showing the greatest turbidity contains the most chlorides. N.B. In mineral waters, chlorides do not necessarily indicate contamination.

3. Test for organic matter — urine, sewage, decaying vegetable and animal matter: Add to each water, one-tenth its volume of dilute (1 in 9) solution of H_2SO_4 , boil; then add enough of dilute (1 in 1000) solution of $\text{K}_2\text{Mn}_2\text{O}_8$, to get a color decidedly rose-tinted; boil 5 minutes; good drinking water will not change the rose-red tint.

4. Test for sulphates—contaminations, provided tests 2 and 3 show it also: Add to the same quantity of all waters examined, one drop of pure HCl , and then about 10 drops of BaCl_2 solution; shake well; the water showing the most turbidity contains the most sulphates. (Good drinking water does not give a ppt. with BaCl_2 .)

5. Test for lime salts — com-

pounds of Ca not necessarily indicating contamination: Add 10 drops of ammonium oxalate to all waters to be examined; the one showing the greatest turbidity, contains the most lime.

6. Tests for CO_2 , and carbonates: Lime water, same quantity to all waters examined; that showing the most turbidity, contains the most. (Not injurious to the health, unless too much Ca, or MgCO_3 .)

7. Test for ammonia and ammonium salts: Use Nessler's solution.

8. Test for sulphur compounds: Odor of rotten eggs; blackens the surface of Hg, immersed in the water for a few hours.

9. Test for iron: 10 drops of K_4FeCy_6 ; blue color. Test for Pb and Cu: Add a few drops of HCl; then H_2S ; dark colored ppt.

10. Take reaction with litmus paper, red and blue.

XVIII. 1. Compare distilled water with hydrant water: in comparing them,

the more unsuccessful the tests, the better the waters.

2. Compare the hydrant water with samples of water supposed to be unfit for drinking purposes.

3. Compare Saratoga mineral water, Hathorn Spring, with Waukesha water, White Rock Spring; note taste of the waters.

4. Compare Londonderry Lithia water, with Ypsilanti water.

XIX. Tests for poisons: To each unknown solution, add 20 drops of HCl , and shake well; if a ppt., turbidity, or haziness occurs, suspect the presence of Ag , Pb , or Hg . (ous salts only).

To tell which is which, proceed as follows: To all ppts. add plenty of NH_4HO , and shake well: if the ppt. is dissolved, a compound of Ag is present. If ppt. is blackened, a compound of Hg .

If the ppt. is neither dissolved nor blackened, but if anything, rather increased in bulk, a com-

pound of Pb is present. (Caution: In testing for lead, use plenty of strong solution—half test tube full.) After describing which solution contains Pb, which Ag, and which Hg, verify by special tests, using previous notes.

Form: Solution No. 1 contains a soluble solution of..... because, on adding HCl..... which.....by adding NH_4HO .

Special tests: Solution No. 2, with.....gives a.....

The following questions, in order: 1. Formula for the ppt., in each case with HCl. 2. Is the ppt. by HCl, soluble in HNO_3 ? 3. What general statement may be made, as to the solubility of ppt?

XX. To all samples add plenty HCl, as in XIX: if a ppt. occur, proceed exactly as in XIX; if no ppt. with HCl, further add plenty H_2S to same solution, to which HCl has been added; note color of any ppt. formed. If black or brown, suspect

Hg, (ic), Cu, Pb, Bi, Sn, Au, Pt. If yellow suspect Cd, As. If orange, suspect Sb. If the ppt. with H_2S is dark colored, take fresh sample, and try in turn the spl. tests, you have had for Hg(ic), Cu, Pb.

If the ppt. is lemon yellow, either Cd or As is present (compounds of Cd are rare): Presence of As can be proved by Marsh test. If the ppt. is orange, Sb is present. Verify by spl. tests with HCl; adding to fresh amt. a drop or two of HCl; then more and shake; what happens in case tartar emetic, for example, is the Sb compound present? See previous notes. Answer the following questions: 1. Formula of the ppt. on adding H_2S . 2. Solubility of these ppts. in HNO_3 . 3. What color has solution of compounds of Cu? 4. Will HCl ppt. a very dilute solution of Pb?

XXI. All poisons in review, and test in advance the soluble compounds of

Fe, Mn, Zn, Al, Co, and Ni. Proceed as follows:

1. If no ppt. with HCl , or with HCl plus H_2S , take fresh amt. of the solution, and add NH_4HO , NH_4Cl and $(\text{NH}_4)_2\text{S}$; note color of final ppt. (disregarding any ppt. with NH_4HO); if final ppt. is black, suspect Fe, Co, Ni: Use K_4FeCy_6 , with fresh amount, to detect Fe, (a deep blue with its salts).

2. If final ppt. with NH_4HO , plus NH_4Cl plus $(\text{NH}_4)_2\text{S}$, is white or greenish, suspect Zn or Al. Fresh amount and test for Zn. Reactions of Zn are as follows: With a drop of NH_4HO , a white ppt. soluble in excess. Fresh amt. with plenty K_4FeCy_6 ; a greenish white. If not Zn, test for Al; which gives ppt. with NH_4HO , not soluble in excess; and to fresh amt., nothing with K_4FeCy_6 . (Except green or blue color Fe impurity).

3. If final ppt. with NH_4HO plus

NH_4Cl plus $(\text{NH}_4)_2\text{S}$, is flesh colored, Mn is present. If plainly green (not greenish or greenish white), suspect Cr.

Note: All reports to be made out as follows: Sol. plus HCl gives? Sol. plus HCl , plus H_2S gives? Sol. plus NH_4HO , plus NH_4Cl , plus $(\text{NH}_4)_2\text{S}$, gives? If the last gives a ppt., then spl. test with K_4FeCy_6 . Spl. test with NH_4HO . Spl. tests of review poisons. N.B. $(\text{NH}_4)_2\text{S}$, forms-ous sulphides, except with Al and Cr, which yield-ic hydrates. Write formulæ of all ppts.

XXII. Test for Ba and Ca according to general scheme.

Special tests: Ba plus K_2CrO_4 gives yellow ppt. Ca, plus K_2CrO_4 , gives nearly the same color as the reagent. Ba, or Ca, plus $(\text{NH}_4)_2\text{CrO}_4$, gives white ppt., insoluble in acetic acid, but soluble in HNO_3 .

XXIII. Test for all poisons in review, and

Mg in advance, according to the general scheme . Tests: Solution plus NH_4HO , plus NH_4Cl , plus Na_2HPO_4 , gives white ppt., soluble in dilute HNO_3 , and in $\text{C}_2\text{H}_4\text{O}_3$, and insoluble in dilute NH_4HO .

XXIV. Everything in review and (NH_4) in advance. Nothing with general scheme 1 to 5. Take fresh amt. and boil with KHO , to get smell of ammonia gas, indicating presence of compound of ammonium.

Tests for K and Na: Nothing from 1 to 6: Take fresh amt. and burn powder in colorless Bunsen flame: Yellow flame shows presence of sodium: Violet flame shows presence of potassium.

XXV. Test for all poisons in review, and also test for chlorides, sulphates, and nitrates as per scheme. Note that chlorides are precipitated by AgNO_3 , and that the ppt. must be both insoluble in HNO_3 , and soluble in NH_4HO . Note that mercuric chloride, however, gives white

ppt. with AgNO_3 , insoluble in NH_4HO . Note that BaCl_2 gives a ppt. with salts of Ag, which is not indicative of a sulphate. Why?

XXVI. Tests for all poisons in review, and for oxalic acid and potassium cyanide in advance. Oxalic acid: Solution is acid in reaction: No ppt with the usual reagents: Fresh amt. with fresh lime water, white ppt., insoluble in acetic acid, soluble in HNO_3 . Fresh amount with CuSO_4 , a light bluish or greenish ppt. sometimes appearing slowly, and not readily soluble in acids, but dissolved to a blue liquid (not precipitated), by NH_4HO .

Potassium (or any alkali) cyanide: The solution is alkaline in reaction. No ppt. with usual general reagents: To fresh amt. add solution of KHO , or NaHO ; then solution of FeSO_4 ; then add a drop or two of HCl ; prussian blue ppt. indicates presence of a cyanide.

XXVII. Everything in review, and mor-

phine, strychnine, and quinine, in advance. Test for last three. If nothing found by work up to this exercise, test for morphine, strychnine, and quinine. Add a drop of HNO_3 to all powders. Morphine gives reddish yellow color (so also does Brucine). To those which do not respond to HNO_3 test, add to a few crystals one drop of H_2SO_4 ; also to a crystal of K_2CrO_7 ; then mix with a glass rod and get purple color, changing to red, if strychnine be present.

To any powder not answering to this test, dissolve in water plus one drop, only, of H_2SO_4 if necessary to dissolve it. Then add chlorine water, and NH_4HO ; bright green color shows quinine or its salts. N. B. To tell morphine from brucine: Both give reddish yellow color with HNO_3 ; but morphine gives blue color, with ferric chloride solution neutralized by addition of magnesium carbonate.

XXVIII. Substances which a class should be required to recognize in their laboratory examination should include at least the following:

Organic poisons: Oxalic acid, chloral hydrate, carbolic acid, morphine, strychnine, and quinine. Inorganic poisons: Potassium-bromide, carbonate, dichromate, hydrate, permanganate, cyanide, iodide. Silver nitrate, sodium hydrate, iodine, bromine, ammonium hydrate, zinc sulphate, zinc chlorate, mercuric chloride. Arsenous oxide, potasso-stibyltartrate (Tartar emetic), plumbic acetate, cupric sulphate, alums in general, ferric chloride, manganese sulphate, barium chloride, nitric acid, hydrochloric acid, sulphuric acid.

Scheme for detection of poisons, covering the whole year's work, and useful for laboratory examinations.

I. Dissolve poison in water and proceed as follows: 1. To solution add HCl, if any ppt., try action

of NH_4HO . 2. If nothing with 1, to fresh solution, add HCl , plus H_2S ; if any ppt., try spl. tests. 3. If nothing with 2, next to fresh solution, add NH_4HO , plus NH_4Cl , plus $(\text{NH}_4)_2\text{S}$; if any ppt., try spl. tests. 4. If nothing with 3, next to fresh solution, add NH_4HO , plus NH_4Cl , plus $(\text{NH}_4)_2\text{CO}_3$; if any ppt., try spl. tests. 5. If nothing with 4, to fresh solution add NH_4HO , plus NH_4Cl , plus Na_2HPO_4 (test for Mg). 6. If nothing with 5, take fresh solution and heat with KHO , and smell fumes, (test for NH_4). 7. If nothing from 1 to 6, inclusive, take fresh amt. of dry substance and try flame test for Na , and K . Note: No. 1 detects Ag , $\text{Hg}(\text{ous})$, Pb (not dilute). No. 2 detects Pb , Hg , Cu , As , Sb (no others required). No. 3 detects Zn , Al , Fe , Mn . (No others required.) No. 4 detects Cu , Ba . No. 5 detects Mg . No. 6 detects NH_4 . No. 7 detects K , Na .

Having found what metal is

present, begin again, and test for the "Acid radicals"; test for chlorides, sulphates, nitrates, bromides, iodides, cyanides, acetates; and also hydrates. Proceed as follows: A. Test for chlorides; to fresh solution of original substance add solution of AgNO_3 ; ppt. is soluble in NH_4HO ; insoluble in NHO_3 ; shows a chloride. Note exceptions: HgCl_2 yields ppt. with AgNO_3 , *not* soluble in NH_4HO . B. If no chloride present, next test for sulphates: to fresh solution add BaCl_2 ; white ppt. insoluble in acids, shows a sulphate. C. If no sulphate be present, next test for nitrates: to fresh amt. of solution add a small piece of FeSO_4 , and let a few drops of H_2SO_4 trickle down side of tube; dark color indicates a nitrate. D. If no nitrate is present, next for bromide: add H_2SO_4 to *dry* substance; fumes and color of Br, shows a bromide. E. If no bromide, test for iodide; to fresh solution add one drop of Cl

water and some starch mucilage; blue color shows iodide. F. If no iodide, next test for cyanide: to a fresh solution, add solution of FeSO_4 , then KHO , then one drop HCl ; Prussian blue indicates cyanide.

G. If no cyanide, next test for acetate: heat with a little H_2SO_4 , and smell acetic acid. Caution: Do not boil your nose.

H. Last, test for hydrates, (K & Na , recognized by form; NH_4 , recognized by odor).

Report: Suppose you find, by 1 to 7, Zn to be present, and in same solution, by A to H, a sulphate; in this case then, report ZnSO_4 to be the poison.

If no metal found, pass on to organic poisons.

Examination Papers in Medical Chemistry and Toxicology. 1887.

PROF. CLIFFORD MITCHELL, M.D.

Pharmaceutical Chemistry: 1. Formula, color, and solubility in water and in alcohol of the following Homœopathic remedies:

Alumina.

Ammonium muriaticum.

Ammonium carbonicum.

Antimonium tartaricum.

Argentum nitricum.

Arsenicum album.

Calcarea carbonica.

Calcarea phosphorica.

Hepar sulphuris calcareum.

Kali bichromicum.

Mercurius corrosivus.

Mercurius biniodatus.

Mercurius dulcis.

Mercurius Iodatus.

Acidum nitricum.

Silicea.

2. In general how are metals prepared in the pure state for Homœopathic use?
3. What are the chemical constituents, of the following:
Fowler's solution.
Labarraque's solution.
Donovan's solution.
Lugol's solution.
Monsel's solution.
Condy's disinfecting fluid.
Burnett's disinfecting fluid.
Quevenne's iron.
Epsom salt.
Salt of sorrel.
Rochelle salt.
Paris green.
Red precipitate.
White precipitate
4. Mention the most important solvents for pharmaceutical compounds.
What class of substances does water dissolve? What, alcohol?

5. Give the proper chemical names for the following:
 - Oil of vitriol.
 - Sal ammoniac.
 - Caustic potash.
 - White vitriol.
 - Tartar emetic.
 - Calomel.
 - Corrosive sublimate.
 - Arsenic (the poison).
 - Chromic acid.
 - Prussic acid.
 - Carbolic acid.
6. Give modern chemical terms for the following:
 - Sulphuret of iron.
 - Lithate of soda.
 - Muriate of morphia.
 - Peroxide of hydrogen.
 - Ammoniated submuriate of mercury.
7. Why is sugar of milk so well adapted for the purposes for which it is used?
8. What substances are dangerous to triturate?
9. How is "*Merc. sol.*" made?

10. What results if you mix nitric acid with carbolic acid? sulphuric acid and water? glycerin and acids?
-

Chemistry and Toxicology. 1888.

PROF. CLIFFORD MITCHELL, M.D.

Answer any three questions on Toxicology, and any three on Urinary Analysis, among the required questions; answer all the optional questions you can.

- REQUIRED: 1. Tell what you know about ARSENIC, giving *formula, color, solubility* in water and alcohol, *fatal dose, post-mortem appearances, treatment*. Describe at least one *test*.
2. Treatment of *opium* poisoning and of *strychnine*.
3. What would you use as an *emetic*? as *stimulants*? as *bland liquids*?
4. Of what use, in treatment of poisoning, is *ferric hydrate*? of what use is *atropine sulphate*? *chloroform*?

white of egg? dilute acids? dilute alkalies?

5. Symptoms of poisoning by *carbolic acid?*
6. Describe the *physical characteristics* of normal urine.
7. Describe a test for *albumin*.
8. How would you detect *sugar* in the urine?
9. What would lead you to infer that a urinary sediment contained *pus*?
10. Mention the three most important normal constituents of urine, from a clinical standpoint, and state why you think important?

OPTIONAL: 11. A patient complains that he has burning pain in the stomach and bowels; he has a nauseating metallic taste in his mouth; there is vomiting of blood and stringy mucus, diarrhea with bloody stools, urine scanty; symptoms set in *very soon* after drinking an unknown liquid. What was probably the poison, and by what chemical tests would you prove it?

12. The patient is drowsy, pupils contracted, breathing slow and stertorous; what poisons would you think of, and how differentiate?
13. The patient is wildly delirious, has dry skin, dilated pupils, great thirst and dryness of the throat. What poison would you suspect? treatment?
14. A patient voids more than three pints of urine in twenty-four hours, and much at night; the sp. gr. is low, albumin present in small amount. Supposing disease of the kidneys to be present, what form is it most likely to be?
15. In what diseases do we find a *large amount* of albumin present in the urine?
16. Describe the urine of diabetes mellitus, lardaceous degeneration of the kidney, cyanotic induration of kidney, acute febrile processes.

Theoretical Chemistry.

Inorganic Pharmaceutical Chemistry.

1890.

1. Define matter, mass, molecule, atom, element, compound.
2. Of the following, point out those which are positive to hydrogen, and those which are negative to it: Sb, Sn, S, Si, Sr, Se, C, Co, Cd, Ca, Cu, Cr, Cl, B, Ba, Bi, Br, Mn, Mg, Mo, Pt, Pd, Pb, P, N, Na, Ni, As, Au, Ag, Al, F, Fe, I, Ir, Hg, Zn, K, O, Li.
3. Give the proper *chemical* name to each of the following: HCl , H_2S , H_2SO_4 , $(\text{NH}_4)\text{HO}$, AgNO_3 , HgCl_2 , As_2O_3 , $\text{Ca}(\text{HO})_2$, K_2CrO_4 , H_2O , Fe_2Cl_6 , KNaSO_4 , HNO_3 , Na_2HPO_4 , NaClO , $\text{Ca}_3(\text{PO}_4)_2$, $\text{K}_2\text{Cr}_2\text{O}_7$, KClO_3 , $(\text{NH}_4)\text{Cl}$, NH_3 , BaCO_3 , CaS , K_2CO_3 , NaCl , SiO_2 , HgCl , NaHCO_3 , FeSO_4 , FeS , CuSO_4 , $(\text{NH}_4)\text{MgPO}_4$.

4. In question 3, explain the valence of Hg, Fe, (NH_4) , Cu, wherever they occur.
5. In question 3, classify all binaries, all acids, all hydrates, all normal salts, all "basic" salts, all double salts, all "acid" salts, all "neutral" salts.
6. In question 3, select those which are readily soluble in water, those slightly soluble in water, those wholly insoluble in water.
7. In question 3, give the names used in Homœopathic Pharmacy for any fifteen of them.
8. Describe the color and general appearance of the fifteen you select.
9. Substitute chemical formulæ for the following commercial terms: bichromate of potash, borax, sal tartar, aqua fortis, oil of vitriol, lunar caustic, arsenic, corrosive sublimate, sal-ammoniac, green vitriol, calomel, sulphuret of iron, common salt, iodide of potash, aqua ammoniæ, muriatic acid, muriate of iron, blue

vitriol, Epsom salt, Glauber salt, white vitriol, flowers of sulphur, yellow prussiate of potash, red phosphorus.

10. In general how may *Cuprum*, *Plumbum*, *Stannum*, and *Platina* be prepared in the pure state for Homœopathic use? what metal is obtained by boiling its chloride with glucose and sodium carbonate? how is *Mercurius Vivus* purified? how is *Aurum Metallicum* precipitated from solutions of the chloride? what is *Ferrum Redactum*?

Chemistry and Toxicology. 1891.

PROF. CLIFFORD MITCHELL, M.D.

Corrosive Sublimate, Tartar Emetic, Arsenic, Oxalic Acid, Carbolic Acid, Illuminating Gas, Muriatic Acid, Potassium Ferrocyanide, Calcareo Phosphorica, Saccharum Lactis, Fusel Oil, Alcohol, Sul-



phuric Ether, Chloroform, "Morphine," "Strychnine," "Atropine," "Cocaine," Lunar Caustic, Caustic Potash, Epsom Salts, White Vitriol, Prussic Acid, Cyanide of Potash, Ammoniated Submuriate of Mercury.

1. Give the proper chemical name to any *ten* of the above.
2. Give the proper chemical formula of any *twelve* of above.
3. Tell which are inorganic and which organic, in the whole list. Classify the organic substances mentioned.
4. Pick out those which are sufficiently soluble in water for you to test their solutions without the necessity of adding acid to dissolve them.
5. Explain why some of them are inclosed in quotation marks.
6. Pick out the five poisons used most commonly, that is, either by criminals or by those committing suicide, or by ignorant persons.
7. Describe *in full* the treatment of poisoning by these five.
8. Pick out any of above whole list which

are useful in Homœopathic Pharmacy, and show why they are useful.

9. Pick out any one which you know to be a valuable drug in Homœopathic practice and tell how to make either the first trituration, or the first decimal dilution, whichever you choose.
10. Pick out any which you know to be found in the human body, and tell where they are found, what purpose they subserve, and if in solution, how they came to be so dissolved.

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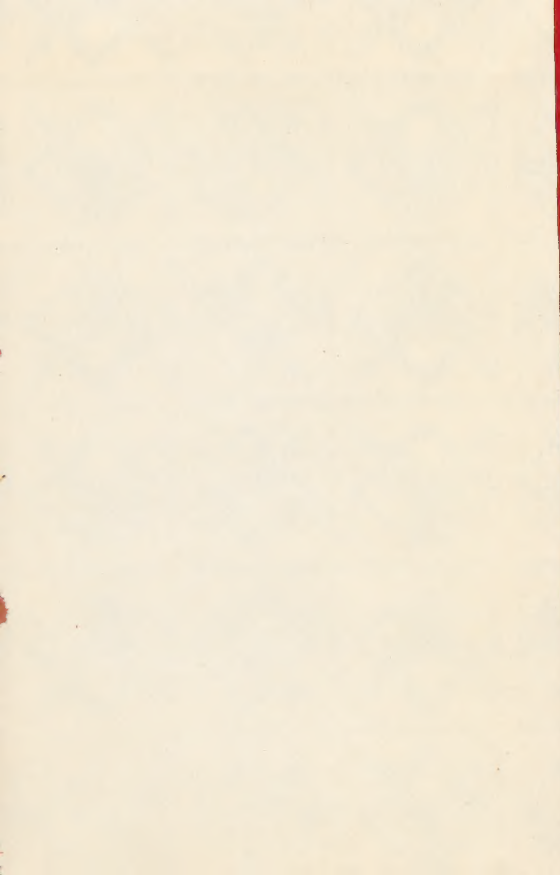
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